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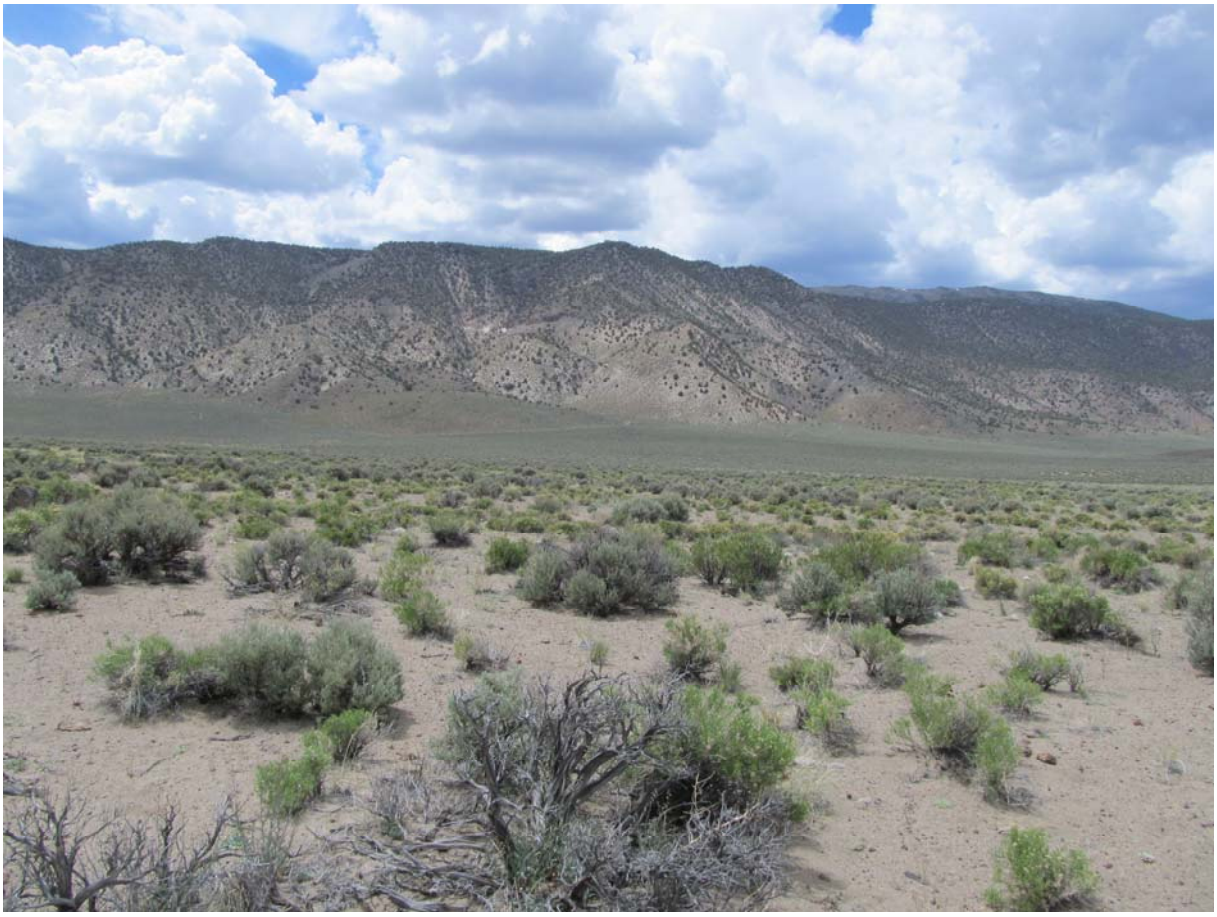
Final Environmental Impact Statement for

Geothermal Leasing on the Humboldt-Toiyabe National Forest



USDA Forest Service
Humboldt-Toiyabe National Forest
Sparks, Nevada

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Final Environmental Impact Statement For Geothermal Leasing on the Humboldt-Toiyabe National Forest Ely, Austin, Tonopah and Bridgeport Ranger Districts

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Abstract: In accordance with **t**he Energy Policy Act of 2005 (Public Law 109-58, August 8, 2005), Secretarial Order 3285A1, amended February 22, 2010, and Forest Service obligations under Section 225 of the Energy Policy Act, the Forest Service is required to facilitate the development and production of geothermal energy. This environmental impact statement (EIS) documents the National Environmental Policy Act (NEPA) analysis for geothermal leasing of lands in the Humboldt-Toiyabe National Forest planning area.

The planning and decision areas for the Geothermal Leasing on the Humboldt-Toiyabe National Forest Final EIS encompass four separate areas on the Humboldt-Toiyabe National Forest. The Bridgeport Geothermal Decision Area encompasses the Nevada portion of the Bridgeport Ranger District (approximately 607,560 acres) with the exception of areas identified previously as non-consent and lands being analyzed under separate environmental analysis at the time of the EIS. The Tonopah Geothermal Decision Area covers approximately 166 acres. The Austin and Ely Geothermal Decision Areas cover approximately 3,961acres and 3,538 acres, respectively. The four decision areas total approximately 615,225 acres, which makes up the entire planning area analyzed in this EIS.

This EIS analyzes four alternatives: the Proposed Action, the Proposed Action with Enhanced Stipulations for Sage Grouse and Traditional Cultural Properties (TCPs) and Sacred Sites, the No Action, and the Proposed Action with Updated Sage-grouse Management. The decision resulting from this analysis would not affect any prior decisions on pending and existing geothermal leases or lands made available under previous Forest-Level Availability Determination Decisions. In addition, this decision would not make any leasing determination decisions on any lands being analyzed under separate environmental analysis at the time of the EIS.

This EIS tiers to and incorporates by reference those elements of the 2008 Geothermal Programmatic Environmental Impact Statement (PEIS) that are appropriate for such use (e.g., resource impact analysis, stipulations, leasing procedures, and best management practices).

This document can be found on-line at: **http://www.fs.usda.gov/goto/htnf/geothermal**. This document is also available on CD-ROM or in hard copy upon request from the Forest Offices listed below.

Forest Supervisor's Office	Austin Ranger District	Bridgeport Ranger District	Ely Ranger District
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ACRONYMS AND ABBREVIATIONS

	Full Phrase
BLM	United States Department of the Interior, Bureau of Land Management
BMP	best management practice
°C	degrees Celsius
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CH_4	methane
CO_2	carbon dioxide
COA	condition of approval
DOE	Department of Energy
DOI	United States Department of the Interior
EIS	environmental impact statement
EPA	United States Environmental Protective Agency
ESA	Endangered Species Act of 1973
°F	degrees Fahrenheit
FLPMA	Federal Land Policy and Management Act of 1976
GIS	Geographic Information Systems
MBTA	Migratory Bird Treaty Act
$\mu g/m^3$	micrograms per cubic meter
MOU	Memorandum of Understanding
MW	megawatt
LRMP	land and resource management plan
NAAQS	National Ambient Air Quality Standards
NDOW	Nevada Department of Wildlife
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
N_2O	nitrous oxide
NOI	Notice of Intent
NRHP	National Register of Historic Places
PEIS	programmatic environmental impact statement
PM_{10}	particulate matter with an aerodynamic diameter of 10 microns or less
$PM_{2.5}$	particulate matter with an aerodynamic diameter of 2.5 microns or less
ppb	parts per billion
ppm	parts per million
PSD	Prevention of Significant Deterioration
RFDS	reasonably foreseeable development scenario
RMP	resource management plan
RNA	Research Natural Area

ACRONYMS AND ABBREVIATIONS *(continued)*

	Full Phrase
ROD	Record of Decision
ROI	region of influence
ROW	right-of-way
TCP	traditional cultural property
US	United States
USC	United States Code
USGS	United States Geological Survey
VQO	Visual Quality Objective

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

The Energy Policy Act of 2005 (Public Law 109-58, August 8, 2005) establishes a goal for the Secretary of the Interior to approve 10,000 megawatts (MW) of electricity from non-hydropower renewable energy projects located on public lands. This includes developing energy using solar, wind, and geothermal resources. Further, Secretarial Order 3285A1, amended February 22, 2010, establishes the development of environmentally responsible renewable energy as a United States (US) Department of Interior priority. The Forest Service has obligations under Section 225 of the Energy Policy Act to facilitate the development and production of geothermal energy.

The State of Nevada, through the Renewable Portfolio Standard, has mandated that investor-owned utilities generate, acquire, or save at least 20 percent of their produced electricity from renewable energy systems by 2015. The State of California, a potential customer of Nevada's geothermal energy, has mandated that 33 percent of electrical power be derived from renewable energy sources by 2020. Geothermal resources, along with oil and gas, fall under the Forest Service Leasable Minerals Program. The Geothermal Steam Act of 1970 gives the Secretary of the Interior authority to issue geothermal leases on National Forest System lands and regulate subsurface geothermal activities through the US Department of Interior, Bureau of Land Management (BLM) [30 United States Code (USC) 1002, Sec.3].

The BLM has the delegated authority to issue geothermal leases on federal lands. It is the policy of the federal government, consistent with Section 2 of the Mining and Mineral Policy Act of 1970 and Sections 102(a)(7), (8), and (12) of the FLPMA (43 USC 1701 et seq.), to encourage the development of mineral resources, including geothermal resources, on federal lands. The Geothermal Steam Act of 1970 (30 USC Section 1001, et seq.), which was amended and supplemented by the Energy Policy Act of 2005, provides statutory guidance for

geothermal leasing by the BLM. New federal geothermal development regulations (43 CFR Parts 3000, 3200, and 3280 – Geothermal Resource Leasing and Geothermal Resources Unit Agreements) were made effective June 1, 2007 (72 Federal Register 24358, May 2, 2007), as a result of a directive provided in the Energy Policy Act of 2005. These statutes and regulations delineate lands that are available and unavailable for leasing.

In response to lease nominations and inquiries from industry, the BLM has requested the concurrence, or consent, of the Forest Service to lease National Forest System lands in the Humboldt-Toiyabe National Forest for future geothermal exploration, development, and production. BLM may only lease nominated National Forest System lands with Forest Service consent [43 Code of Federal Regulations (CFR) 3201.10(a) (2)]. Prior to providing concurrence to the BLM for leasing, the Forest Service is responsible for conducting a National Environmental Policy Act (NEPA) analysis for leasing to determine appropriate lease stipulations under which leases may be developed and for ensuring decisions are consistent with the Humboldt and Toiyabe National Forests Land and Resource Management Plans, as amended (LRMPs).

In 2008, the BLM recommended, and the Assistant Secretary–Land and Minerals Management approved, the Record of Decision (ROD) associated with the Programmatic Environmental Impact Statement (PEIS) for Geothermal Leasing in the Western United States. The 2008 Geothermal PEIS and ROD were prepared pursuant to the planning requirements of the Federal Land Policy and Management Act of 1976, as amended (FLPMA), and its implementing regulations at 43 CFR Part 1600, as well as NEPA and its implementing regulations at 40 CFR Parts 1500 through 1508. Decisions in the 2008 Geothermal ROD identified those lands that are legally open or closed to consideration for geothermal leasing on affected National Forest System lands, and provided stipulations, best management practices (BMPs), and procedures for geothermal leasing and development. The Forest Service has determined that additional site-specific environmental analysis is needed to supplement the 2008 Geothermal PEIS in order for the Forest Service to make a decision about providing concurrence/consent to the BLM to lease lands in the Humboldt-Toiyabe National Forest for the purpose of developing geothermal resources.

ES.2 ALTERNATIVE 4 (PREFERRED ALTERNATIVE): PROPOSED ACTION WITH UPDATED SAGE-GROUSE MANAGEMENT

The Forest Service would consent to lease up to approximately 609,780 acres of National Forest System lands administratively available for geothermal leasing. The lands to be made available for leasing encompass most of the Nevada portion of the Bridgeport Ranger District (approximately 602,115 available acres), one area on the Austin Ranger District (3,961 acres), one area on the Tonopah District (166 acres), and one area on the Ely Ranger District (3,538 acres). Leasing would include stipulations from Chapter 2 of the 2008 Geothermal PEIS (BLM and Forest Service 2008) and other stipulations

determined to be reasonable and necessary to protect surface resources as outlined in this environmental impact statement (EIS).

The Bridgeport Geothermal Decision Area encompasses a total of 607,560 acres. Under this alternative, no consent would be provided for lands within the Jacks Spring RNA (1,272 acres) or the East Walker River Scenic Area (4,173 acres). The area of consent for the Bridgeport Geothermal Decision Area would, therefore, encompass 602,115 acres.

This alternative incorporates decisions from the 2008 Geothermal ROD as well as additional protective stipulations and constraints. Some of these additional protective stipulations and constraints are applied as additional protections for resource areas already identified for at least some protection. Other stipulations and constraints are applied to identify areas for which a higher level of protection beyond the standard stipulations is appropriate. The proposed action stipulations include no surface occupancy, controlled surface use, and timing limitations.

Based on the Humboldt and Toiyabe LRMPs and current resource data for the decision areas, BLM has identified locations within the decision areas as no surface occupancy and controlled surface use. Calculations for these acres are approximate and may be greater than the actual area identified through field verification for future phases of geothermal leasing and development. The no surface occupancy and controlled surface use data also do not include areas for which data is unavailable or is proprietary. In areas where both controlled surface use and no surface occupancy stipulations have been identified, the no surface occupancy stipulations would be applied.

Alternative 4 is similar to Alternative 1(Proposed Action) and analyzes the same decision areas for consent to lease. The stipulations under this alternative are the same as under Alternative 1 except for the sage-grouse stipulations. This alternative includes updated habitat classification and protection measures for sage-grouse and includes the following stipulation.

Sage-Grouse Stipulation

Lands categorized as Nevada Department of Wildlife (NDOW) greater sage-grouse habitat categories 1 and 2 (preliminary priority habitat) and 3 (preliminary general habitat) are designated as no surface occupancy. Stipulations under this alternative apply to both the greater sage-grouse and the greater sage-grouse bi-state distinct population segment.

Under this alternative, pre-construction field surveys would be conducted after a lease is issued. There may be, as a result of a site-specific proposal and NEPA, a decision to deny or relocate part of a proposal, in the form of a condition of approval for areas identified as preliminary priority habitat or preliminary general habitat. Conditions of approval could also be applied to other areas that

are identified as critical to the life process for sage-grouse (e.g., movement corridors).

Finally, lands that are leased would be subject to further NEPA analysis prior to exploration or development to establish whether the lessee would be required to implement measures to minimize impacts (such as from noise and dust) to greater sage-grouse and their habitat on leased lands.

The preferred alternative provides consent to leasing, but the analysis is not specific to project, activity, or site. Subsequent site-specific, ground-disturbing geothermal exploration or development projects would require further environmental analysis, such as an environmental assessment or an EIS that could tier to this EIS and the 2008 Geothermal PEIS. The authorizing officer would determine the appropriate level of analysis. The stipulations would apply to future actions and the Renewable Energy Action Team Desert Renewable Energy Projects BMPs and the International Energy Agency Handbook of Best Practices for Geothermal Drilling could be incorporated, as appropriate, into new leases, associated permits, and conditions of approval.

ES.3 PURPOSE OF AND NEED FOR ACTION

The purpose of the action is to determine if certain lands within the Humboldt-Toiyabe National Forest may be made available for geothermal leasing and, if so, to provide consent to leasing of lands and to identify reasonable and necessary stipulations to protect surface resources. The need for the action is to allow the Forest Service to satisfy its respective statutory and policy mandates in responding to requests for the environmentally responsible development of energy resources; to address provisions of the Energy Policy Act of 2005 (Sections 211 and 222[d][1]); and respond to other policy directives calling for clean and renewable energy.

ES.4 PLANNING AREA AND DOCUMENT SCOPE

The planning and decision areas for the Geothermal Leasing on the Humboldt-Toiyabe National Forest EIS encompass four separate areas on the Humboldt-Toiyabe National Forest.

The Bridgeport Geothermal Decision Area encompasses the Nevada portion of the Bridgeport Ranger District (approximately 607,560 acres) with the exceptions of areas identified previously as non-consent and lands being analyzed under separate environmental analysis at the time of the EIS. The Tonopah Geothermal Decision Area covers approximately 166 acres. The Austin and Ely Geothermal Decision Areas cover approximately 3,961 acres and 3,538 acres, respectively. The four decision areas total approximately 615,230 acres, which make up the entire planning area analyzed in this EIS.

The decision resulting from this analysis would not affect any prior decisions on pending and existing geothermal leases or lands made available under previous Forest-Level Availability Determination Decisions. This decision would not

make any leasing determination decisions on any lands being analyzed under separate environmental analysis at the time of the EIS.

ES.5 OTHER ALTERNATIVES

Four alternatives are evaluated in detail in the EIS: the Preferred Alternative 4 (as described above), the no action alternative, and two additional action alternatives. The no action alternative and the two additional action alternatives are summarized below.

Alternative 1: Proposed Action

The Forest Service would consent to lease up to approximately 615,225 acres of National Forest System lands administratively available for geothermal leasing. The lands to be made available for leasing encompass most of the Nevada portion of the Bridgeport Ranger District (approximately 602,115 available acres), one area on the Austin Ranger District (3,961 acres), one area on the Tonopah District (166 acres), and one area on the Ely Ranger District (3,538 acres). Leasing would be subject to stipulations from Chapter 2 of the 2008 Geothermal PEIS (BLM and Forest Service 2008) and other stipulations determined to be reasonable and necessary to protect surface resources as outlined in this EIS.

The Bridgeport Geothermal Decision Area encompasses a total of 607,560 acres. Under this alternative, no consent would be provided for lands within the Jacks Spring Research Natural Area (1,272 acres) or the East Walker River Scenic Area (4,173 acres). The area of consent for the Bridgeport Geothermal Decision Area would encompass 602,115 acres.

The proposed action incorporated decisions from the 2008 Geothermal ROD as well as additional protective stipulations and constraints. Some of these additional protective stipulations and constraints are applied as additional protections for resource areas already identified for at least some protection; other stipulations and constraints are applied to identify areas for which a higher level of protection beyond the standard stipulations is appropriate. The proposed action stipulations are discussed in detail in this EIS.

Based on the Humboldt and Toiyabe LRMPs, and current resource data for the decision areas, locations within the areas have been identified for no surface occupancy and controlled surface use stipulations. Due to the sensitive nature of sage-grouse lek data, the no surface occupancy areas shown for sage-grouse are approximate. Calculations for no surface occupancy acres are, therefore, also approximate and may be greater than the actual area identified through field verification for future phases of geothermal leasing and development.

Alternative 2: Proposed Action with Enhanced Stipulations for Sage-Grouse, and Traditional Cultural Properties (TCPs) and Sacred Sites

Alternative 2 would be similar to Alternative 1 (Proposed Action) and would analyze the same decision areas for consent to lease. However, this alternative

was developed to address the sage-grouse data and management guidance available at the time the Draft EIS was being prepared and to address concerns expressed through tribal consultation.

Under this alternative, leasing would include stipulations from Chapter 2 of the 2008 Geothermal PEIS (BLM and Forest Service 2008) and other stipulations determined to be reasonable and necessary to protect surface resources as outlined in this EIS, However, the following stipulations would be implemented and would replace the sage-grouse stipulation outlined for Alternative 1 (Proposed Action).

Sage-Grouse Stipulation
The Alternative 2 sage-grouse stipulation would prohibit surface occupancy and surface-disturbing activities within three miles of an active lek. The stipulation would also prohibit surface occupancy and surface-disturbing activities within field verified active sage-grouse nesting and active early brood-rearing habitat if they fall outside the three-mile radius from a lek. Standard exceptions apply (Section B.2, Nevada Governor's Sage-Grouse Conservation Team 2010). The exceptions may be granted in consultation with NDOW, depending upon the active status of the lek, location of existing infrastructure, or the geographical relationship of topographical barriers and vegetation to the lek site.

For timing restrictions and additional guidance related to limiting impacts on sage-grouse, follow NDOW energy guidelines (Nevada Governor's Sage-Grouse Conservation Team 2010).

Stipulation for Native American Sacred Sites and Traditional Cultural Properties (TCPs)
No surface occupancy would be allowed within one mile of traditional cultural properties (TCPs) and Native American sacred sites, as identified through consultation.

Alternative 3: No Action
NEPA regulations require an agency conducting an EIS to "include the alternative of no action" (40 CFR Part 1502.14). The "No Action" alternative means continuing with the present course of management based on the current Forest Plans.

Alternative 3 is the No Action Alternative. The No Action Alternative would not make an availability determination on lands within the planning area. Processing of geothermal lease applications and nominations would continue, however, they would be evaluated on a case-by-case basis under separate NEPA analyses.

ES.6 REASONABLY FORESEEABLE DEVELOPMENT SCENARIO

A reasonably foreseeable development scenario (RFDS) for geothermal resources was developed to serve as a basis for analyzing environmental impacts

resulting from future leasing and development of federal geothermal resources within the planning area.

Potential for the entire Bridgeport Geothermal Decision Area was estimated to be 170 MW by 2025. Since RFDS for the entire decision area estimates a total production capacity of 170 MW by 2025 and the average power plant is in the range of 30 MW to 50 MW in capacity, it is estimated that three to six power plants would be built across the decision area. The total acreage of disturbance for a single power plant ranges from 53 to 367 acres. Maximum development of six power plants would result in as many as 2,202 total estimated disturbed acres across the decision area.

Potential for the Austin, Ely, and Tonopah Geothermal Decision Areas is based on the assumption that, on a per-site basis, geothermal resources of sufficient quantity and quality would be present to support one 50-MW power plant, that such a sized plant would be constructed, and that up to 367 acres would be disturbed. The RFDS for these three decision areas would add an additional 150 MW and 1,101 acres of disturbance to the RFDS.

Therefore, the total RFDS for the project, including the Bridgeport, Austin, Ely, and Tonopah Geothermal Decision Areas, is 320 MW produced by 9 power plants, resulting in a long-term disturbance of approximately 3,300 acres. This RFDS is an estimate of the maximum potential development and disturbance. Actual development and disturbance may be much lower and would be determined based on the future phases of geothermal development as well as constraints identified for each of the decision areas.

ES.7 IMPACT ANALYSIS

Providing consent for geothermal leasing, in and of itself, does not cause any direct impacts as defined by CEQ regulations, which states that such effects "are caused by the action and occur at the same time and place" (40 CFR 1508.8[a]). It is reasonable, however, to foresee that on-the-ground impacts would occur if the BLM issues geothermal leases but that the impacts would not occur until some point in the future. Therefore, the analysis in the EIS addresses both direct and indirect impacts based on the foreseeable on-the-ground actions, including exploration, drilling, and utilization. These impacts cannot be analyzed site-specifically, but they are analyzed for the planning area based on the RFD scenario. Additional site-specific analysis would be conducted during the permitting review process for subsequent exploration, drilling, and utilization applications.

A typical geothermal electrical generation plant has a surface disturbance of between 53 to 367 acres for all associated activities, such as exploration, drilling, and construction, depending on site conditions and the type of geothermal plant. Reclamation is done on areas that are no longer needed for these activities, so the actual area of disturbance for an operating power plant is generally much less. Geothermal resources also provide a wide range of direct

use applications, which can require land disturbances of less than one acre to more than 50 acres. Geothermal development has similar short-term impacts as other land disturbing activities but has fewer long-term impacts compared to other energy generation activities. If geothermal leases were developed per the RFDS, the following general impacts would be expected:

- Long-term loss of vegetation, habitat, and soil;
- Short-term and intermittent noise impacts from construction, maintenance and operations activities;
- Short- and long-term impacts on some recreational opportunities from construction and operation of energy infrastructure;
- Long-term visual impact from power plants and infrastructure;
- Short-term impacts on groundwater during drilling;
- Long-term impacts on other land uses, such as livestock grazing, on lands occupied by geothermal facilities; and
- Short-term increase in air emissions from drilling and construction activities. Compared to nonrenewable energy sources, electrical generation with geothermal resources has minimal emissions. Therefore, on a megawatt basis, geothermal production would have a beneficial long-term impact in reducing emissions and greenhouse gases.

The cumulative impacts associated with geothermal development, such as erosion, habitat loss and fragmentation, propagation of invasive species, and viewshed degradation, would occur but would be relatively minor. At the maximum projected build out in 2025, up to 2,202 acres could be disturbed from exploration, drilling, and utilization and operational activities. This represents less than 0.01 percent of the 615,225 acres of Forest Service lands within the planning area. Geothermal developments also tend to have relatively small operational footprints compared to other uses (such as wind farms and oil and gas fields) and are generally compatible with other uses, such as livestock grazing.

The subsequent impacts from geothermal leasing are relational to the areas that are available for leasing and areas subject to no surface occupancy and controlled surface use stipulations. Although the acres identified for consent to leasing are the same for Alternatives 1, 2, and 3, the areas subject to no surface occupancy vary and correspond to the level of direct impacts for each of the decision areas. The no surface occupancy areas are outlined in **Table ES-1**, Comparison of No Surface Occupancy Acres between the Action Alternatives, for each of the decision areas. No surface occupancy for sage-grouse stipulations are noted in parentheses. Due to the sensitive nature of sage-grouse lek data, the no surface occupancy acres calculated for sage-grouse are

Table ES-1
Comparison of No Surface Occupancy Acres between the Action Alternatives

Decision Area	Alternative 1 Acres	Alternative 2 Acres	Alternative 4 Acres
Bridgeport	79,400 (75,000 for sage-grouse) [1]	171,000 (169,600 for sage-grouse) [2]	185,400 (183,900 for sage-grouse) [3]
Austin	10	1,600 (1,600 for sage-grouse) [2]	3,110 (3,110 for sage-grouse) [3]
Ely	3,300 (3,300 for sage-grouse) [1]	3,300 (3,300 for sage-grouse) [2]	800 (800 for sage-grouse) [3]
Tonopah	0	0	166 (166 for sage-grouse) [3]
Totals – rounded to 100	82,800 (78,300 for sage-grouse) [1]	175,900 (174,500 for sage-grouse) [2]	189,500 (188,000 for sage-grouse) [3]

[1] Based on 3-mile buffer of active sage-grouse lek sections.
[2] Based on no surface occupancy for alternative 1 and 3-mile buffer of sage-grouse lek points merged with nesting habitat.
[3] Based on NDOW sage-grouse habitat categories 1, 2, and 3.

approximate. The no surface occupancy data also do not include areas for which data is not available or is proprietary, but may include acres that overlap portions of the East Walker Scenic Area that have yet to be digitized. Therefore, calculations for no surface occupancy acres may be greater or less than the actual area identified in the table and will be based on field verification conducted for future phases of geothermal leasing and development. Controlled surface use stipulations are the same under all of the action alternatives and are not included in the table.

The No Action Alternative does not formally identify areas for consent to leasing or subject to stipulations. Current management relies on the LRMPs and amendments for determining any allocations on a case-by-case basis. If such determinations are not made, additional NEPA and a possible land use plan amendment would be required.

Under Alternatives 1, 2, and 4, a comprehensive list of stipulations would be implemented, and subsequent permitting and analysis would be required to avoid, minimize, and mitigate impacts associated with geothermal leasing, exploration, drilling, utilization, and reclamation and abandonment.